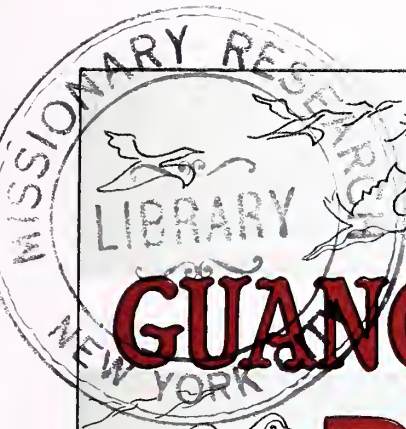
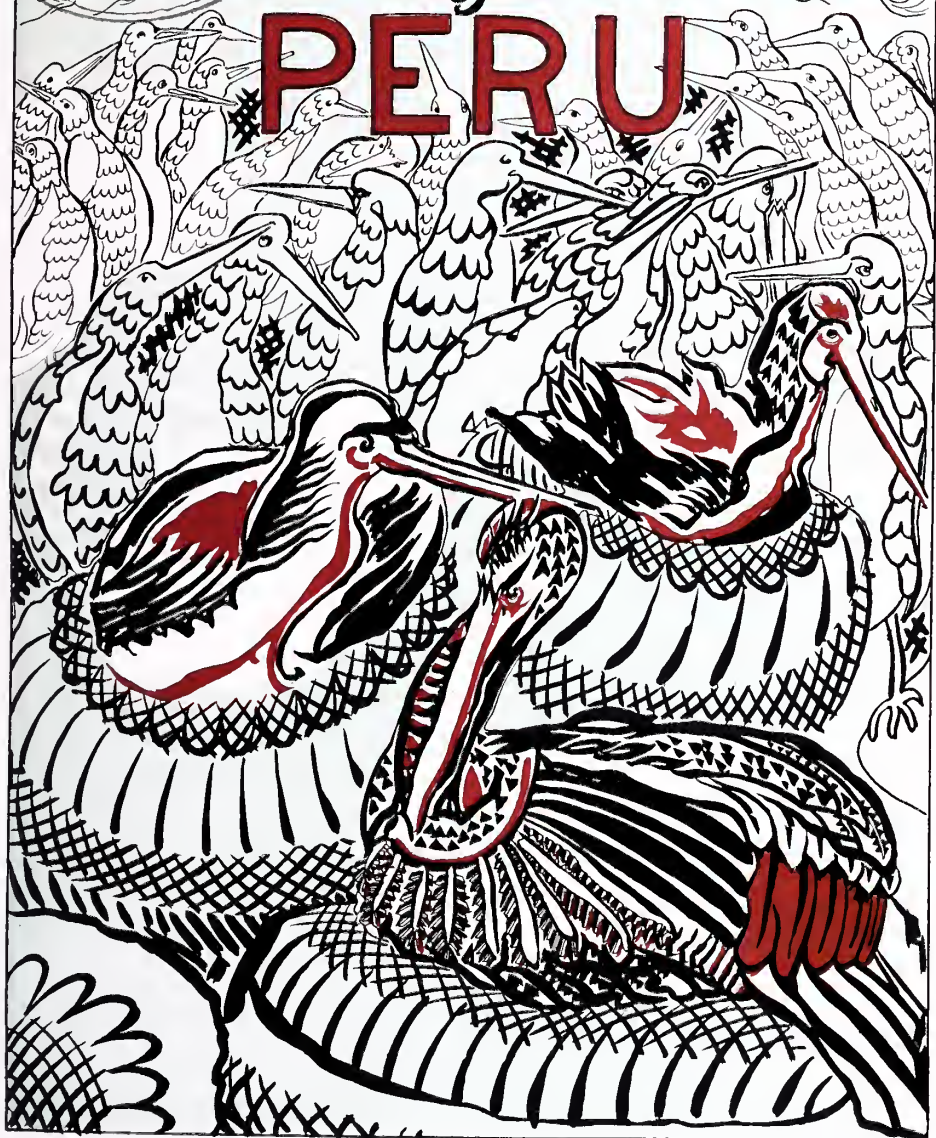


APR 13 1948



THE GUANO ISLANDS of PERU





The Americas
A Continent of Friendly Nations

THE GUANO ISLANDS

By

MAE GALARZA

Cover and Map by

DOROTHY SWEETSER

Photographs by courtesy of

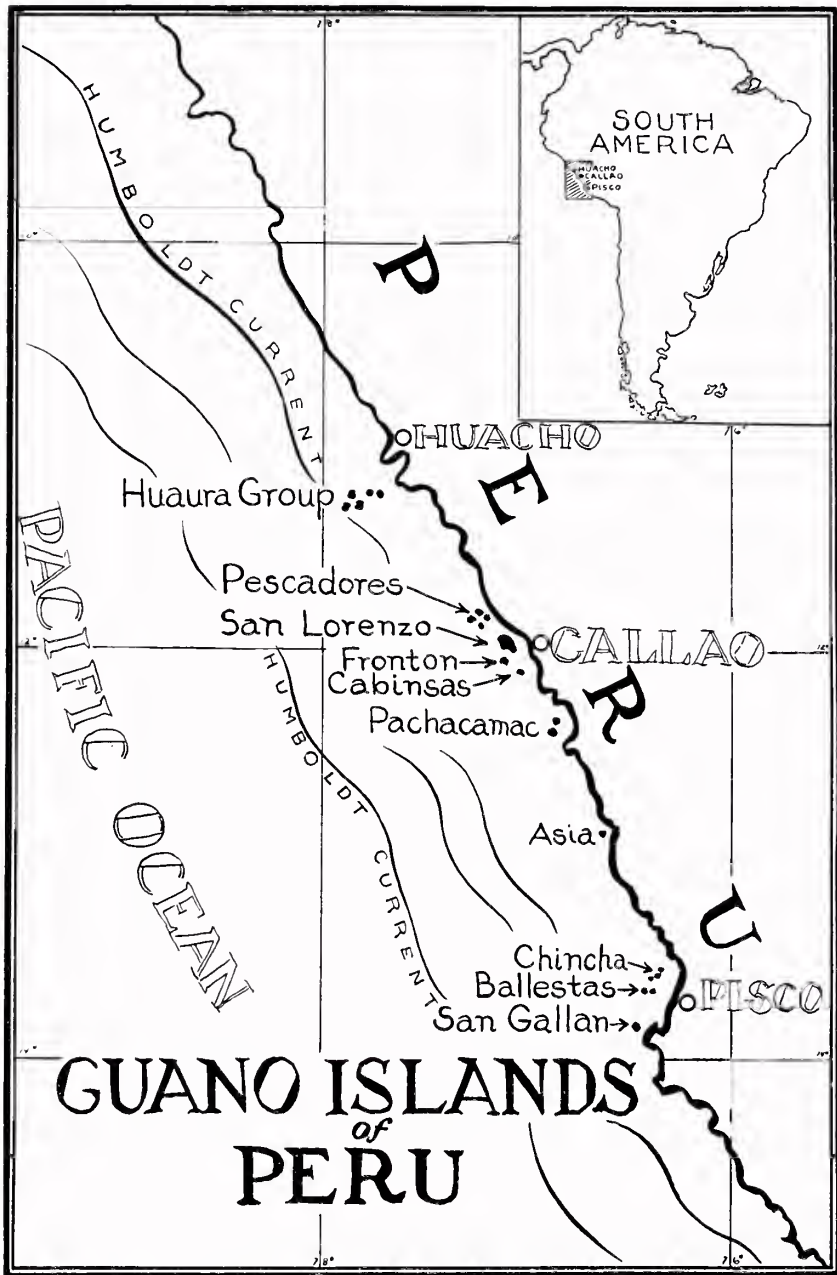
WILLIAM VOGT

Published by

THE PAN AMERICAN UNION

WASHINGTON, D. C.

1945



HUMBOLDT CURRENT



H
U
A
C
H
O

H
U
A
R
A
G
R
O
U
P

P
E
S
C
A
D
O
R
E
S

S
A
N
L
O
R
E
N
Z
O

F
R
O
N
T
O
N
C
A
B
I
N
S
A
S

P
A
C
H
A
C
A
M
A
C

A
S
I
A

C
H
I
N
C
H
A
B
A
L
L
E
S
T
A
S

S
A
N
G
A
L
L
A
N

C
A
L
L
A
O

P
I
S
C
O

PACIFIC OCEAN

GUANO ISLANDS of PERU

PERU OWNS GOLD DUST FOR ITS SOIL. This high powered soil tonic, the fertilizer guano, is the excrement of three kinds of birds—the Guanay, Piquero and Alcatraz. They nest in great groups on a string of small rocky islands near the coast which look as if they were heaved out of the blue ocean. On this long chain of some forty desert islands these wonderful birds court, incubate, raise their young and rest for twelve months of the year. The guano that accumulates from some nine or ten million birds is a natural resource quite as valuable as forests, oil wells or copper mines.

Soil needs water and sun, and it must contain the right elements, or plant food, to produce. Good soil can be made better by fertilization. Since guano contains the three chief plant foods in an especially assimilable form—nitrogen, phosphorus and potash—it is the most complete and valuable of all fertilizers. The lack of rain and the hot rays of the sun dry the bird deposits on the islands and prevent these plant foods from being washed away.

The nitrogen content of the guano is due to four factors—the kind of bird that produces it, the atmospheric conditions, the age of the guano, and the ocean's richness in nitrogen. The guanay produces fertilizer with the highest nitrogen content, the piquero next and the alcatraz the least. The drier the air the less volatile is the nitrogen and more of it remains in the guano. Guano exposed to the air constantly loses nitrogen. For this reason the quicker the fertilizer is extracted from the islands and transported to the fields and put into the soil the more effective it is.

Guano smells like ammonia and may be any of various colors, yellow, white, yellowish red or drab brown, depending on the age and dryness of the composition. Dr. Robert Cushman Murphy, a student of the birds, has said that if the value of fertilizer depends on its nitrogen content, the best Peruvian guano is more than 33 times as effective as farmyard manure.



Three guanay nests to a square yard

In ancient Peru the land supplied food to a much greater population than now inhabits that country. The intensive use of the soil greatly reduced its content of lime and nitrogen. Peru's agriculture would fail without fertilization. In 1827 a citizen of Arequipa (Peru's second largest city situated in an agricultural area) wrote that in this section it would be impossible to raise good crops without fertilizer because the soil was of volcanic origin and sandy. About a hundred years ago experiments with the "bird island" product were made in England and the knowledge of the precious guano began to spread around the world.

In 1936 the farms of Peru needed twice as much guano as was then being produced, so imported fertilizer had to be used also. The greater portion of the guano is used to produce better cotton, sugar, foods and flax. Forty percent of the agricultural area of the coast produces cotton. Without fertilizer this desert land would become so poor in three or four years that the crops would not pay.

In 1939 about one third of the normal amount of guano was produced. The government company in charge of the

guano has therefore experimented with various ways of improving its use. These experiments have shown that it is important to crush the dry guano well, and that it should be covered with at least ten inches of soil.

The guano bird is like the hen that laid the golden egg, only it lays something far more valuable. One scientist has stated that "the guanay is worth a billion dollars, a source of national richness of the first order which is able continuously to renew itself."

The guanays have probably lived for more than 100,000 years and were nesting on the coast and islands long before man arrived on the Western coasts of America. Being birds of Antarctic origin, they are able to exist as far north as Northern Peru due to the cold temperature of the Humboldt Current. A single formation like a brood flock forms a solid stream of birds which may take four or five hours to pass a given point.



Peruvian cormorant or guanay

The guanay is principally a black and white bird, looking much like a penguin, but thinner. His back, wings and head are black. Under his chin is a white patch and his breast is snowy white. He drags his short tail like the train of an evening dress. The eyes are set in brilliantly red, featherless flesh. He carries his body upright, walks well but swims and dives better.

The guanay is one of the most gregarious birds, often living in groups of

one million. The birds rest in groups that look like huge, ink-like spots a half mile in diameter spattered on the white guano. The birds seem more crowded than people on a Coney Island beach on a sweltering holiday. They are not only gregarious but expressive. They make a low murmur like rolling water when they are approached on the table land or slopes.

The guanay breeds once each year, the full period taking about four months—one month of courtship, one for laying and incubating and two months for care of the young. The cock first selects his site for a nest. From time to time he will double the neck back until he touches his tail with his head, after which he quacks like a duck. This display he keeps up at intervals until a hen chooses him. But since he takes his time in accepting her, the hen has to do a little courting herself. Having chosen the nesting site, he remains there and defends it vigorously except during the time that he must leave to seek food.

The first birds choose sites with an abundance of wind, for this affords them a cooler and fresher place. Hot sun



The guanay is not distributed by man's work



The flocks look like huge ink spots

rays kill the young. The first nests are in the center of a large irregular circle. The cock shows more interest in building the nest. He pulls up pieces of guano while the hen collects stones, feathers, seaweed, straw and grasses. It is a big job to collect material for the nest. Small objects like pebbles and feathers give solidity to the guano as straw does to an adobe brick. Frequently nesting material is scarce so birds will begin robbing stones and grasses from unguarded nests. The robbers sometimes destroy the eggs and injure the young. Building goes on even after eggs are laid and the young hatch. The male's interest in building the nest seems stronger even than in the preservation of his young.

The nests on the border of the cluster are not as safe. Sea gulls and buzzards can more easily eat the young or eggs. In the past, before guano was collected with regularity, the birds could use old nests and build higher sides. This was a protective measure, too, for eggs would not so easily roll out nor would the young clamber over.

The nest is a high ring of guano, looking something like a young lady's turban. The top is scooped out for the eggs. The nests are usually a foot or more apart so that the island is covered with thick mounds of guano.

The female lays from two to six eggs and they are warmed for twenty-seven days before the chicks hatch. The two parent birds share the nesting, never leaving the nest unguarded unless food is very scarce. The care of the young is also shared. Each parent carries food once or more times a day, depending on abundance. A few hours after hatching, the young ask for food, ramming their heads down the parental throat, sometimes three at a time.

The parent bird should not take more than a half day to feed from his great store house, the sea. If the birds must spend a longer time feeding then the nest is left unprotected and thousands of fledglings are lost. That is why the sea must be well stocked with fish.

Chicks at one month leave the nest to wander about. They want to bathe in the sea, to exercise their wings and make their first attempts to fly. Soon they are forming groups on the flat surfaces like the adults. At two months they

seek the water's edge. When the banks are high (some of the islands have no beaches) thousands die in the effort to reach the sea.



Piqueros nesting on cliffs

Guanays eat principally anchovetas, small fish four or five inches long which swim in enormous schools near the surface of the water. Flying in bands, the first guanays locate the fish, dive in and gobble voraciously and rest on the water. The birds flying over the resting ones go through the same



A scientist collects specimens of sea life

process. This continues until the school is gone. Then they find another. This maneuver of the birds encircles the fish more or less and sometimes forces them up the beaches. It is estimated that each bird eats 172 pounds of fish and produces 35 pounds of guano each year. The birds needed 712,000 tons of fish in order to produce the 1940 crop of guano.

Hundreds of thousands, perhaps millions, of birds during the last two and a half years have lost their lives from malnutrition. Their food, the anchoveta fish, has been too scarce in the sea around the islands.

Of the three classes of birds producing guano, the guanay is the most numerous. About ninety percent of the birds are of this kind, which produces the most fertilizer.

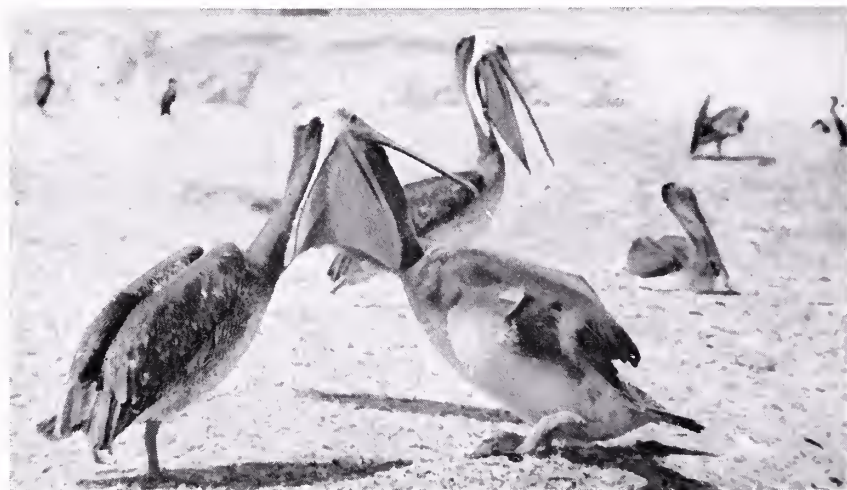
The piqueros, the second most important class of birds producing guano, are beautiful with their smooth white neck, head and breast. Their wings and back are brownish gray flecked with white. The beak, webbed feet and legs are blue-gray. *Piquero* is the Spanish word for lancer, and without doubt has been applied to this bird because of his

skillful thrust when entering the water for food. Dr. Murphy says of these spectacular divers: "Piqueros fish from the air plunging headlong with great force from an average height of fifty feet into the water almost directly. Like great flying spearheads they strike the water and disappear in the jet of foam which spurts upward as they hit the surface."

Although at times the piqueros nest in great groups on flat warm sections of the islands, they usually nest on ledges formed by steep cliffs forty and fifty feet above the sea. The piquero can stand more heat than the guanay so he can use sections of the islands unsatisfactory to the latter.

The alcatraz, or pelican, the third class of bird producing guano on the sunbeaten, rocky islands, is very large and cumbersome-looking in comparison with the other two birds. His bill is a foot long with a long shallow sack underneath. His manner of resting his head against his long neck makes him a very awkward appearing fellow.

In past years thousands of these birds were slaughtered by reckless guano collectors in order to get them out of the way of the guano diggers. This without doubt is one reason



Young pelican diving into his parent's throat



A soaring brown pelican

for their reduced number today. However, the lack of anchovetas near the nesting grounds caused the loss of tens of thousands of chicks of the alcatraz in February, 1941.

Both alcatraz adults gather material in the pouch under the beak for the construction of their nest. This material includes sand, guano, pebbles, and feathers. The bird returning with construction material pours the contents of this pouch over the back of the incubating bird who places it around the nest. The eggs are warmed for more than a month and the young are cared for more than two months.

What brings these birds to Peru's front door? The Humboldt Current, tropical sun, southern winds, lack of rain, the abundance of lower forms of animals of land and sea are some of the reasons. The cold stream of water coming from some ocean depth west of Valdivia, Chile, proceeding north and bathing the entire coast of Peru and extending out many miles to sea is called the Humboldt Current in honor of a scientist by the name of Humboldt who studied and explained it at the beginning of the last century. This cold ocean river flows slowly northward and brings with it

myriads of sea life as well as countless numbers of sea birds. The guano birds are creatures of this rich storehouse of food.

The sun is of great importance because it dries the guano, thus preventing the loss of nitrogen and giving the fertilizer its particular value.

The southeast trade winds laden with moisture from the Atlantic in passing drop their moisture on the east side of the high Andes leaving only a dry breeze for the coast of Peru. So the west coast is a barren desert except for the narrow valleys along the rivers which have cut their way through from the interior of Peru. The guano islands are completely bare; there is not a blade of grass to be seen. The climate is dry, windy, sunny and rather pleasant on the rocky slopes of the islands.

The anchoveta is the most abundant fish along the shore. One scientist suspects that it lives on minute forms of plant life like algae and travels in enormous schools, leaving the southern waters of Peru when the temperature of the water rises. In some years there is a serious decrease in their number and a lack of food for the birds. It may also be that as the temperature of the ocean along the coast rises, the anchoveta seeks other waters. In 1941 the abnormal weather and the corresponding lack of anchoveta food for the birds brought about a 50% reduction in their number. Some islands were uninhabited by the birds.

A friend of the guano bird is the ground spider which lives on the ticks that suck blood from the birds. These ticks, which look like a ball of guano, can live months or years without food, so they would be very hard to eliminate by artificial means. Lizards on several of the islands also are a natural aid to the birds for they, too, eat the parasites, lice and ticks.

Guano has a long history. Always the Peruvian farmer has had difficulty in obtaining water for his land, but he has had a compensation in the form of guano. The ancient

Peruvians knew the valuable use of guano which they found on the islands and points of the coast. Relics of kitchen equipment have been found under layers of guano and the fertilizer has been found wrapped around mummies in Southern Peru possibly as a preservative. The Incas worked into their textiles figures of the birds and painted them on jars. Garcilaso de la Vega of Cuzo (a city of Peru high in the Andes famous for its Inca ruins) published a book in 1604, before the Pilgrims landed in Plymouth, in which he refers to the guano. In his book he speaks of great flocks of birds off the coast and mountains of guano.

Until about 1840 the beds of guano, deposited by millions of birds, remained almost untouched. Layers 120 feet high covered the islands like huge glistening helmets. About this time the government leased the rich deposits to contractors or middlemen, who resold them. This was considered a means of making money to help pay government expenses. But it took many years to eliminate the methods of making fabulous sums by the contractors. The contractors sold to anyone, so guano began enriching soils of many parts of the world.



Feeding birds cloud the sky

About 1843 vessels began taking away hundreds of thousands of tons of fertilizer. It is said that more than ten million tons were extracted between 1851 and 1872 from a small group of islands, amounting to twenty or thirty million dollars worth each year.

Peck, a North American traveler wrote "The New York Times" about conditions on the islands in 1853. In this report it was said that the only labor on the islands were Chinese coolies or slaves. Their grim faces showed the effects of merciless treatment—long working hours, scanty food, no recreation. Scantily clothed, the coolies bared their skin to the hot sun and the knotted ropes of negro task masters who kept them working at a fast pace. Their lives were short for they soon died or leapt off the cliffs crazed by torture.

It has been stated that the guano industry is the greatest of all business enterprises built upon the conservation of wild life. There has been a progressive increase in the population of birds since the guano company was established in 1909.

The islands are bird kingdoms. On these rocky projections their welfare is studied continuously by highly skilled scientists. Their findings determine how the guano is to be gathered and how the birds are to be treated by the workmen.

At the beginning of the nineteenth century many of the islands had "deep crowns of guano and a population of birds that covered their surface." The years of wasteful use and high profits left only 23,000 tons of the precious plant food by 1910.

In thirty-two years the company has turned over to the government 14,250,000 dollars, paid welfare taxes, and fertilized the farmer's lands. The conservation of the guano birds by the company has paid for itself handsomely. The company tries to sell the guano to the farmer as soon as possible because in storage valuable nitrogen is lost. The islands are practically brushed clean of guano. About half of the islands were cleaned of guano in 1941.

The company also recommends the analysis of the soil on the farms that use guano in order to determine what nourishing elements the land needs. For a small sum the company performs this service in its laboratory for the farmer. This enables the farmer to use just enough fertilizer and to select the kind of guano best suited to his land. The company controls the amount sold to the farmer. An expert visits each farm to be sure that the farmer gets only enough for his land.

Although most of the fertilizer is sold to large farms of cotton, sugar and flax, the small proprietor gets his share. City dwellers with potted plants and lawns are urged to buy the product.

In years when guano is scarce and the farmer cannot obtain as much as his land requires, he is told how to mix guano with mineral fertilizers.

The company is an organization of some 2,000 employees working on the islands, the coast and the middle section of the country, the Sierra Valley. Some are trained and experienced administrators and scientists while others are the pick and shovel workmen. On some of the islands they have constructed modern workers' quarters and hospitals. The company owns boats, shipyards, machinery and office buildings. There is radio communication between the main office and the islands when work is in progress. Each month a bulletin is published with articles about guano or related subjects as well as farm information from other parts of the world.

Most of the valuable information about the guano birds and their habits, their care and the best ways to use the fertilizer has been gathered by scientists brought to Peru by the company. These scientists have suggested, for example, that airplanes should fly at a distance from the islands since the sound of motors frightens thousands of birds, who leave their nests without protection. One of the scientists, William Vogt, spent three years studying the guano birds intensively.

Many questions about the birds remain partly or wholly unanswered. Scientists today and the young people of today who will be the scientists of tomorrow must grapple with these problems. Here are some of them:

Why does the temperature of the water around the coast and islands of Peru change? Why are there more anchoveta in one year than in another? What are the factors that result in a depression in the bird cycle about every seven years? What are the weather conditions over long periods of time, temperature, humidity, direction and velocity of the winds? What is the amount of salt, nitrates and phosphates of the sea at various seasons and in different years? How fast do the anchoveta grow, how long do they live, what are their food and breeding habits? What are the migration habits of the guano birds? Why do some go south and others north?

To understand the guano industry it is necessary to know a great deal about the almost invisible algae that float in the Humboldt Current, which are eaten by fish which in turn are eaten by birds which deposit the guano which is used by man to grow more and better food. This is the fascinating and winding thread of nature which man will never cease to follow. For it leads him to understand man's resources and to control their use for the benefit and happiness of all humanity.



THE PAN AMERICAN UNION is an international organization maintained by the twenty-one American Republics. It was established in 1890. The purpose of the Pan American Union is to promote peace, commerce and friendship among all the Republics. The Union is supported by annual contributions from all the countries in amounts proportional to population.

The special divisions maintain close relations with private and governmental organizations as well as with individuals in the countries members of the Union. These divisions gather information on foreign trade, health, statistics, education, economics, intellectual cooperation, agriculture, travel, and labor and social information and many other subjects.

Inter-American conferences are organized by the Pan American Union from time to time. Some of these conferences have been held in the Pan American Union building in Washington, D. C.

Pan American Day is celebrated annually throughout the Americas on April 14.

Published Titles of the Series for Young Readers

JOSÉ DE SAN MARTÍN
THE ARAUCANIANS
THE PANAMA CANAL
THE PAN AMERICAN HIGHWAY
THE GUANO ISLANDS OF PERU
FRANCISCO PIZARRO
CABEZA DE VACA'S GREAT JOURNEY
THE INCAS
THE SNAKE FARM AT BUTANTAN
THE PAN AMERICAN UNION
FIVE BIRDS OF LATIN AMERICA
SIMÓN BOLÍVAR
THE AZTEC PEOPLE
HERNÁN CORTÉS
THE PAN AMERICAN SANITARY BUREAU
JOSÉ GERVASIO ARTIGAS
THE AMAZON RIVER
JOSÉ MARTÍ
COLONIAL CITIES OF SPANISH AMERICA
TRANSPORTATION IN THE OTHER AMERICAS

Five cents each

Order from
THE PAN AMERICAN UNION
WASHINGTON 6, D. C.